. 21 No. 2 (New Series No. 80) December 1960

ANALYSIS

F MICHIGAN
DEC 27 1960
PERIODICAL READING ROOM

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ANALYSIS 21.2 DECEMBER 1960

EDITORIAL

The Editor will be visiting Brown University, in the United States, between January 15th and June 15th, 1961. During his absence, contributions and other correspondence should be addressed to the Acting Editor, Mr. P. T. Geach, at the Department of Philosophy, The University, Birmingham, 15.

FORMAL LOGIC AND ORDINARY LANGUAGE

By L. J. Russell

1. IN any modern formal logic, however close we keep to the meanings of 'if . . . then . . .' and 'either . . . or . . .' in ordinary speech, we want to be able to use the following arguments:

(a) If (If p then q) then (If not q then not p);

(b) If (Either p or q) then (If not p then q) and (If not q then p).

Again we want to be able to use such a proposition as:

(c) If p then p.

We want to be able to use such forms without any restriction as to what shall be substituted for p, q etc., beyond the general ones laying down conditions for well-formed expressions.

Again, given p and q, we need to be able to assert each separately and consider its consequences without reference to the other:

(d) If pq then p.

If they cannot be separated without distortion of meaning, they are not two propositions but one, and this kind of 'and' is quite different from the 'and' we need in our logic. Further (what comes to the same thing) we want to argue that if p is false, then the combination of p with any other proposition is false also:

(e) If not p then not (pq).

Either of these, (d) or (e), leads directly to the 'paradoxes of implication', for any 'If . . . then . . .' logic whatever.
Suppose we accept as true the proposition

If not p then not (pq.) (i)

We also have, involved in the meaning of ' not (pq)',

If not (pq) then (If p then not q) and (If q then not p). (ii)

Combining (i) and (ii) we get

If not p then (If p then not q) and (If q then not p),

and this is true without any restriction on p or on q.

A further principle which seems to me not only true but important is:

(f) If (If either p or q then r) then (If p then r) and (If q then r);

this too leads to the paradoxes. For as a particular case of (c) we have

If (either p or q) then (either p or q)

and this by (f) gives

If p then (either p or q)

and combining this with

If (either p or q) then (If not p then q) and (If not q then p)

we get

If p then (If not p then q) and (If not q then p).

The principle: If p then (either p or q) follows equally from the principle (d): If pq then p: so that it would not help to reject (f), if one accepts (d). For if (d) is accepted we can assert

If not p and not q then not p

and this gives at once

If p then (either p or q).

Principles (d), (e) and (f) will all have to be rejected, if the paradoxes are to be avoided, and I think that the price we should have to pay is too high. All these principles look as if they were just as valid as any other assertion we can make in logic: and they are all necessary if our logical apparatus is to be developed beyond the mere rudiments.

The situation here is similar to the situation in arithmetic, where it was very quickly necessary to break away from the limitation of numbers to positive whole numbers. First negative numbers and fractions, then numbers like $\sqrt{2}$ and finally numbers like $\sqrt{-1}$ had to be accepted, in order to enable arithmetical calculations to be made with the generality which was desirable. Positive whole numbers then took their place as merely one kind of number; the calculations applied to them, but they applied over a wider range.

I think we have to face a similar situation in logic. It does not seem to me sound policy to insist on the complete distinction between the schema '. . . ⊃ . . .' and the schema 'If . . . then . . .', and to recommend that 'p⊃q' should not be read 'If p then q' but 'Either not p or q' or preferably 'not both p and not q' (Strawson, *Introduction to Logical Theory*, p. 38). What do you gain? From 'Either not p or q' you can infer by traditional processes 'If p then q' and vice versa; and you can make the same inferences from 'not both p and not q'. Thus 'p⊃q' and 'If p then q' can be inferred from each other, even on the traditional logic.

If you say that the trouble with '⊃' is that *by definition* 'p⊃q' is true when p is false, and again when q is true, while this is not the case with 'If p then q', the argument I have put forward above about the logical paradoxes makes it clear that unless logical development is to be severely restricted, we must accept even for 'If p then q' the consequence that 'If p then q' is true when p is false or when q is true, even though we do not do this by definition, and even though we are not willing to incorporate it into our everyday use of 'If . . . then . . .'.

2. Let us see what arguments there are against using 'if . . . then . . .' and 'either . . . or . . .' with some degree of freedom from the restrictions found in ordinary speech.

Strawson in his discussion of 'If . . . then . . .' suggests that even so simple an inference as that from 'If p then q' to 'If not q then not p' has to be handled with great caution if it is not to do serious injustice to the meanings conveyed in ordinary speech, and that formal logic gives us no guidance as to this handling. Take his example (p. 83 and 86 n.):

If the Germans had invaded England in 1940 they would have won the war.

Keeping tenses and moods (as we must if we have no guidance) we get for the contrapositive:

If the Germans had not won the war they would not have invaded England in 1940,

and it is clear that the new proposition has entirely different implications from the original.

I would suggest that this is not an argument against the soundness of formal processes, but rather an argument against treating propositions in ordinary speech by formal processes, without adequate preparation. The ordinary proposition not only contains an 'If . . . then . . .' statement, but implies by its moods and tenses that Germany did not invade England, and did not win the war. The new proposition not only

contains an ' If . . . then . . . ' statement, but implies by its moods and tenses that the Germans won the war, and did invade England. The implications belong not to logic but to rhetoric, and must be cut off before the statements are brought into our logical apparatus. If we want to keep them they can be asserted explicitly as separate statements.

The simplest way is that used in the ordinary formal logical apparatus, viz. to use the present indicative in the antecedent and in the consequent, interpreting it as far as possible in a non-temporal sense and without any implication of the truth or falsity of the corresponding statements: for example,

If the Germans invade England in 1940 then they win the war,

the ' if . . . then . . . ' by convention conveying *no more than* that acceptance of the ' if . . . then . . . ' statement and of the statement corresponding to the antecedent commits one to acceptance of the statement corresponding to the consequent. This is all that is essential to the logical ' if . . . then . . . '.

Then if we wish we can add as supplementary statements

1940 is past; statements corresponding to antecedent and to consequent are both false.

The derived statement then becomes

If the Germans don't win the war, then they don't invade England in 1940,

and this is not misleading in the way a statement in ordinary speech could be (by suggesting that their not invading was consequent upon their not winning) because by our convention the *logical* ' if . . . then . . . ' conveys *only* that acceptance of it and of the statement corresponding to the antecedent commits one to acceptance of the statement corresponding to the consequent.

As supplementary statements here we could add

1940 is past; statements corresponding to antecedent and to consequent are both true.

Their truth follows from the falsity of the supplementary statements in the original proposition, and not from anything in the strict hypothetical itself. The austere ' if . . . then . . . ' of logic is in ordinary speech decorated with all kinds of extra significances gained through tenses, order of words, emphasis, context, etc., and we can take them into our logic only as extras, not as belonging of right to the ' if . . . then . . . ' form.

I can bring this out by reference to further points made by Strawson. He says (p. 83) that in ordinary speech ' the standard or primary use of

an " if . . . then . . . " sentence (is) in circumstances where, not knowing whether some statement which could be made by the use of a sentence corresponding in a certain way to the first clause of the hypothetical is true or not, or believing it to be false, we nevertheless consider that a step in reasoning from that statement to a statement related in a similar way to the second clause would be a reasonable step; the second statement also being one of whose truth we are in doubt, or which we believe to be false.'

Now it is true that the form is often used under these circumstances; but I can see no justification for saying that this is its standard or primary use. Such a form as ' if, as you yourself admit ', or ' if, as is generally agreed ' is also common, and we often use ' if ' in cases where we could equally well say ' since ', but don't, because our interest lies in following out consequences. The standard form of *ponendo ponens* shows this: ' If p then q, but p, therefore q.' It would be absurd to say that when you are making the first statement you must *not* be in a position to make the second.

I should argue similarly against Strawson's view (p. 91) that an ' or ' statement ' carries the implication of the speaker's uncertainty as to which of the two it was '. If a person argues ' Look. It must have been either A or B, and it wasn't A. So it must have been B,' I cannot see how his first statement carries any implication of uncertainty. It is true that the ' either . . . or ' form is used in ordinary speech to convey all kinds of significance, through tenses, order of words, emphasis, etc., but its uses are very varied, and Strawson's remark applies only to some uses. In logic we want only the austere basis: if you accept ' either A or B ' you must accept at least one of the two. Anything else can be taken into our logic only as an extra, to be explicitly formulated apart from the ' either . . . or ' form.

On p. 88 Strawson further elaborates his account of the ' primary or standard ' use of ' if . . . then . . .'. He there asserts that for each hypothetical statement made by this use, ' there could be made just *one* statement which would be the antecedent of the hypothetical and just *one* statement which would be its consequent ', and that the antecedent statement must be a ' good ground or reason ' for accepting the consequent statement. He is clear of course that ' good ground or reason ' must be taken very widely.

I do not see why he insists on ' just *one* statement '. In all cases where there is a variety of conditions, each sufficient, for some consequence, each would be a ' good ground ' for the consequent, and yet there would not be just *one* antecedent statement: and again in all cases where there is a variety of consequences following from some condition, each would be accepted with good grounds. And such cases seem to me common in ordinary speech, and just as ' standard ' as any other cases. It is true that

they can be broken up into a number of hypotheticals with one antecedent and one consequent: but this does not involve that there is just *one* antecedent for a consequent or just *one* consequent for an antecedent.

Whatever may be said about all this, from the point of view of logic none of Strawson's conditions can be accepted. What we need as essential for logic is that if a hypothetical statement is accepted, then acceptance of the statement corresponding to the antecedent commits one to acceptance of the statement corresponding to the consequent, and if a disjunctive statement is accepted, one is committed to accepting at least one of the alternatives. Any further implications which ordinary speech carries are supplementary, and should be brought into the account by additional statements.

3. The point I have just been dealing with applies over the whole field of 'if . . . then . . . ' and 'either . . . or . . . ' statements as they occur in ordinary speech. It corresponds to the fact, always recognised in the traditional treatment of categorical propositions and arguments, that ordinary speech forms could not be brought into the technical apparatus without modification. Hence the traditional exercises, for expressing statements in ordinary speech in 'logical form'.

We may give an example of the difficulty we are brought up against if, in relation to statements expressed in ordinary speech, we want to use the principle that from

If either p or q then r

we can deduce

If p then r and if q then r.

Someone says 'Either he must work hard before the examination, or he will fail', and a hearer comments 'In that case the examination can't be just a straightforward intelligence test'. The hearer is making the complex hypothetical statement:

If either he must work hard or he will fail, then the examination can't be a straightforward intelligence test.

Now suppose we go to work on this and draw the consequences:

(i) If he must work hard before the examination then the examination can't be a straightforward intelligence test.

(ii) If he will fail, then the examination can't be etc.

Here (i) can hardly be said to be misleading, so long as the context is allowed to show the sense in which he must 'work hard' viz., work hard in studying the subjects prescribed for the examination. But (ii) as it stands would be seriously misleading, because, without its context, 'will fail' has the meaning 'is sure to fail', losing its hypothetical character.

It would look as if in such a case we should have to express (i) in the form

If he must work hard before the examination (as a condition of not failing), then the examination can't be etc.,

and (ii) in the form

If he will fail (unless he works hard) then the examination can't be etc.,

where the expressions in brackets are necessary to give the full sense of the alternatives.

Coupling the alternatives enables them to be expressed in an abbreviated form; when they are written separately, they have to be expressed more fully. The alternatives are (i) his working hard as a condition of not failing, (ii) his failing if he doesn't work hard.

There are of course many cases where nothing of this sort is needed with statements of the form 'If either p or q then r', because p and q are alternatives without any dependence on one another, as e.g. 'If he either flies or comes by boat then he will avoid the inconvenience of the railway strike'. Where the alternatives do need reference to one another in order to be understood, restatement or explanation is necessary before we can pass to the conclusion 'If p then r and if q then r'.

But this kind of watchfulness is (as I have already said) no different from the care that has traditionally had to be taken in dealing with categorical propositions and inferences.

4. One of the main controversies in this field turns on the question of the tests of the truth of an 'if . . . then . . .' and an 'either . . . or . . .' statement, and again, what their contradictories are. Since 'Either p or q' allows us to infer 'If not p then q' and vice versa, the two types of statement must be dealt with similarly.

Consider Strawson's example on p. 90: 'Either we catch this bus or we shall have to walk all the way home'. 'If we don't catch this bus we shall have to walk etc.' As he says, if it turns out that the bus we caught was not the last one, we should say that the man who had made the statement had been wrong; so that we should not regard our catching the bus as a sufficient condition of the truth of the statement.

If, however, we accept the paradoxes as inevitable if we are to have a developed logic, we shall have to say that once we have caught the bus we can say truly 'If we don't catch this bus we shall have to walk,' even though we agree that so long as we have not caught the bus, the man who makes the statement, believing that this is the last bus, is making a mistake, if it is not the last one. But then the two statements are quite different, made under entirely different circumstances and on different

grounds. It is only because we have caught the bus that we can make the 'true' statement about what will follow if we don't catch the bus. What we are saying is 'If we don't catch the bus (as well as catching it) we shall etc.' What we should have no right to say is 'If we hadn't caught this bus we should have had to walk home,' because of the implications this has for ordinary speech, as conveyed by the verbal forms. What it implies is 'If we don't catch the bus (instead of catching it) we shall etc.' In the region of the paradoxes, we must keep to the austerities of the logical language. It is true that when we are developing the consequences of a given set of premises, we drop mention of the premises and assert the consequences, but this is only because it is generally safe to do so; in the case of the statement that from p and not p we can derive q, whatever q may be, it is seriously misleading to transform this into the statement that given p then from not p we can derive q, and go on to the conclusion 'If not p then q' without any explicit mention of p as the fundamental premise. If you stick to 'If p and not p then q' no one is going to be in danger of taking q seriously.

Let us consider 'If p then q' and ask how its contradictory is to be expressed, if the paradoxes are accepted. There are three conditions for the truth of 'If p then q', each sufficient separately.

(i) If not p, then 'If p then q' is true, formally.
(ii) If q, then 'If p then q' is true, formally.

Non-formally, neither (i) nor (ii) is sufficient to make 'If p then q' true, nor is the actual truth of p and q sufficient. What is regarded as sufficient in ordinary life is such a connexion between p and q as shows that it is not 'possible' to have p without q—'possibility' here being a very wide term, covering the usual or the customary (as in 'If this is Monday then Mrs. Jones will be doing her washing') or what has been decreed (as in 'If a motorist is convicted of breaking parking regulations he is liable to a fine') etc. Strictly speaking, a discussion of all this involves reference to general propositions, even when the propositions corresponding to the antecedent and the consequent of the hypothetical proposition are themselves particular. Leaving this aside here, we can content ourselves with the condition:

(iii) If it is not possible to have p without q then 'If p then q' is true.

For ordinary life this is not only sufficient but necessary, just because in ordinary life we are concerned with the general relationships which form the background of the hypothetical proposition and provide the basis for its justification, independently of whether in a particular case the propositions corresponding to antecedent and consequent happen to be true or not. For our purpose here, which concerns the contradictory

of ' If p then q ', (iii) is the only condition of truth, imposed in ordinary life, of which we need to take account.

We have then three different conditions, from our extended point of view each separately sufficient for the truth of ' If p then q '.

Now the contradictory of ' If p then q ' must be such that the denial of all sufficient conditions for the truth of ' If p then q ' can be deduced from it: in other words, from the contradictory of ' If p then q ', we must be able to deduce: p; not q; and the possibility of having p without q. And we can only do this by making the contradictory the combined assertion of p, not q, and the possibility of p without q. But once we have p and not q, it becomes unnecessary to state the possibility of their combination. It is thus both necessary and sufficient, if we are to contradict ' If p then q ', to assert p and not q.

It must be stressed that all this applies only within our logical apparatus. The criteria of the truth and falsity of hypothetical propositions as they occur in ordinary life are, as I have said, complex and non-formal. Such a statement as ' Even though he didn't come, still, if he had come, he would have voted on our side ' has to be justified in ordinary life by reference to his known intentions, his character, his general attitude, and so on, or questioned by reference to other aspects within the same range of facts. It would be absurd to say that the controversy about how he would have voted is completely unnecessary seeing that the hypothetical statement is true since the statement corresponding to the antecedent is false: for *any* hypothetical proposition with this antecedent, whatever consequent we supplied, would be true on the same ground. It must always be remembered that all logic can provide is the entirely innocuous statement ' If p and not p then q '. ' If he came (as well as not coming), he voted for us '. The form ' If he had come etc. ' means ' If he had come (*instead* of not coming) etc.', to which the logical paradoxer has no right.

5. Let us look briefly at the negation of an ' either . . . or . . . ' proposition. This must conform to what has been said about ' if . . . then . . . '. We have three conditions, each separately sufficient for the truth of ' either p or q '.

(i) If p, then ' either p or q ' is true, formally.

(ii) If q, then ' either p or q ' is true, formally.

From the point of view of logic, the basic meaning of ' either p or q ' is ' of the two: p, q, at least one ': but here again, in ordinary life we are concerned with the general relationships which form the background of the disjunctive proposition and provide the basis for its justification, independently of whether in a particular case one of the alternatives happens to be true or not.

Thus even though he has come by bus, the statement (made beforehand) ' He will come either by train or by bus ' might be challenged (even after he has come by bus) by ' He might have come by car ' (even though he didn't) if, for example, it was his habit sometimes to come by car, and if we had no reason for thinking that he wouldn't on this particular occasion.

So that in ordinary life a disjunctive proposition can be challenged on the ground that the alternatives mentioned are not the only ones which ought to be taken into account.

We then have a third sufficient condition (which from the point of view of ordinary life is also a necessary condition):

(iii) The alternatives stated are alternatives and all the alternatives which ought to be considered.

As in the case of ' if . . . then . . .', the contradictory of an ' either . . . or . . . ' proposition must be such that the denial of all the sufficient conditions for the truth of the proposition can be deduced from it. And as before we can achieve this only by making the contradictory the combined assertion of not p, not q, and the denial that p and q are alternatives and all the alternatives which ought to be considered. Once we have asserted not p and not q, as we must to satisfy the purely formal requirements, we have denied that p and q are alternatives, and hence denied the combined proposition that they are alternatives and all the alternatives. Thus ' not p and not q ' is the contradictory of ' Either p or q '.

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SELF-CONTRADICTION AND ENTAILMENT

By ROBERT J. RICHMAN

THAT 'the cabbage is boiling and the cabbage is not boiling' (C.~C) entails 'the universe is finite but unbounded' (U) does indeed seem odd. After all, how can an event in the kitchen (even an 'impossible event') logically determine the geometry of the universe? And yet, we have learned to distrust our intuitions of oddity in many areas. Perhaps we should do so in the present sort of case as well.

Professor David Rynin has proposed[1] a restriction on the sense of 'entails', and of its converse 'is derivable from' which is designed to eliminate the sort of odd case mentioned above. Rynin, in making this proposal, writes:

> that some relation must hold between the premises and the conclusion in a valid argument. . . . This required relation is in fact that of strict or necessary implication, which we understand in the sense that S necessarily implies S' $\leftrightarrow$ S.~S' is self-contradictory. . . . There are reasons, however, for not wishing to base derivability on necessary implication, for as is well known, it is a sufficient condition for a statement S necessarily to imply another S' if either S is analytically false or S' is analytically true. And hence if it were sufficient for S' to be derivable from S for S' to be necessarily implied by S, we should be able to derive any statement whatever from a self-contradictory one, *and this seems not to accord with at least certain intuitions regarding what is meant by 'derivable'* . . .
>
> The equivalence:
>
> S entails S'$\leftrightarrow$ [(S necessarily implies S') and neither S nor S' is analytic] comes about as close to expressing what I wish to understand by 'entails' as I can come, speaking in this more or less formal manner. Speaking in terms of content, I should try to explicate 'entails' as follows:
>
> S entails S'$\leftrightarrow$a necessary truth condition (ntc) for S is a sufficient truth condition (stc) for S'.[2]

It should be clear, first of all, that these two definitions of 'entails' are not equivalent, and indeed that the second does not represent a restriction of 'necessary implication'. The second definition does not serve to eliminate entailments of the sort first alluded to, since in terms of this definition, C.~C entails U in case there is a statement which is both a necessary condition of C.~C and a sufficient condition of U. It is obvious that there are many such statements, one simple one being C.(~C v U). This entailment is purely formal, and hence quite general. Therefore Rynin is clearly in error when he writes that 'some statement R, logically independent of another statement S, is not derivable from

[1] In 'The Autonomy of Morals', *Mind*, lxvi (July 1957), p. 308.
[2] *Ibid.*, pp. 311f. (Italics not in the original.)

although necessarily implied by the self-contradiction S.~S. The reason is that none of the ntc's for the statement S.~S are stc's for the statement R.'[1]

It appears then that we may safely restrict our attention to the first proposed definition, which requires that in a valid argument neither the *implicans* nor the *implicatum* be analytic. It is clear that Rynin is using 'analytic' here as a generic term under which are to be incorporated the sub-headings 'analytically true' (i.e., 'analytic' in perhaps a more usual sense) and 'analytically false' (or 'self-contradictory'). In terms of *this* definition it is not the case that every statement is derivable from a self-contradiction, since *no* statement is so derivable. Nor does every statement entail an analytically true statement, since *no* statement entails such a statement. Thus, by a simple stipulation we are rid of some affronts to 'certain intuitions'.

Of course, we are now too sophisticated to ask whether, e.g., every statement is *really* derivable from a self-contradictory statement. Rather, we look at definitions pragmatically and consider the advantages and disadvantages of accepting them. I should like to do this with regard to the proposed definition of 'entails'.

As far as I can see the only advantage of this definition is that it eliminates some derivations which are *prima facie* odd. But let us look at some of the disadvantageous consequences of accepting this definition. First, simply in terms of oddity, it would seem at least as odd that a self-contradictory statement should entail no statements as that it should entail every statement. For surely it would be strange for a statement not to entail itself, or for a conjunction not to entail its components (as, on the proposed definition, S.~S would not entail S). The ordinary principles of derivation would not apply to logically determinate statements.

This leads to a second point. On the proposed conception of derivation, *proof*, i.e., derivation from analytic premises, is ruled out. Thus, mathematics and systematic expositions of logic go by the board. This seems no small price to pay.

Problems arise, moreover, with regard to equivalence, in the sense of mutual derivability. For example, on the proposed conception of derivability, we can no longer speak of the equivalence of tautological or of self-contradictory statements. In addition, although it is clear that every inconsistent set of statements is equivalent to a self-contradictory statement (the conjunction of the components of the set), it would seem that we cannot assert such an equivalence. I shall, however, assume this obvious sort of equivalence in order to show certain other difficulties to which the acceptance of Rynin's definition would lead. (I make this assumption since Rynin's formulation speaks only of

[1] *Ibid.*, p. 312.

entailment of a single statement by another, and not of the more common case where a statement is derived from a set of statements. Ordinarily of course, this would make no difference because of the equivalence mentioned above.)

These further difficulties are of the following sort: in order to show that a given argument is valid we should in each case have to demonstrate that the premises are consistent (since, again, no statement is derivable from a self-contradictory statement or from an inconsistent set of statements). To prove for every deductive argument that its premises constitute a consistent set would be at best a nuisance and at worst an impossibility. We should, moreover, be faced with the awkward situation that the addition of a new premise might invalidate a valid argument (if the additional premise were incompatible with some component of the original set).

Besides this, we could not demonstrate the inconsistency of a set of statements by deriving a contradiction from the set, since no such derivation would be valid.

Further objections of a similar sort will occur to anyone who thinks of the proposed conception of entailment. I believe that I have said enough to indicate that it is an unacceptable proposal.

Besides, it may be wondered whether the derivability of every statement from a self-contradiction is so odd after all. Given any ordinary principles of derivation, every statement *is* derivable from a self-contradiction. The *prima facie* oddity of such derivations appears to arise from attributing a certain restricted subject matter to a self-contradictory statement. But, of course, the descriptive subject matter of such a statement occurs only vacuously.

Perhaps the moral to be drawn from the foregoing comments is the by now familiar one (and any moral worthy of the name should be platitudinous) that our intuitions of oddity sometimes display the oddity of our intuitions.

University of Oregon

THE RUNABOUT INFERENCE-TICKET

By A. N. PRIOR

IT is sometimes alleged that there are inferences whose validity arises solely from the meanings of certain expressions occurring in them. The precise technicalities employed are not important, but let us say that such inferences, if any such there be, are analytically valid.

One sort of inference which is sometimes said to be in this sense analytically valid is the passage from a conjunction to either of its conjuncts, e.g., the inference ' Grass is green and the sky is blue, therefore grass is green '. The validity of this inference is said to arise solely from the meaning of the word ' and '. For if we are asked what is the meaning of the word ' and ', at least in the purely conjunctive sense (as opposed to, e.g., its colloquial use to mean ' and then '), the answer is said to be *completely* given by saying that (i) from any pair of statements P and Q we can infer the statement formed by joining P to Q by ' and ' (which statement we hereafter describe as ' the statement P-and-Q '), that (ii) from any conjunctive statement P-and-Q we can infer P, and (iii) from P-and-Q we can always infer Q. Anyone who has learnt to perform these inferences knows the meaning of ' and ', for there is simply nothing more *to* knowing the meaning of ' and ' than being able to perform these inferences.

A doubt might be raised as to whether it is really the case that, for any pair of statements P and Q, there is always a statement R such that given P and given Q we can infer R, and given R we can infer P and can also infer Q. But on the view we are considering such a doubt is quite misplaced, once we have introduced a word, say the word ' and ', precisely in order to form a statement R with these properties from any pair of statements P and Q. The doubt reflects the old superstitious view that an expression must have some independently determined meaning before we can discover whether inferences involving it are valid or invalid. With analytically valid inferences this just isn't so.

I hope the conception of an analytically valid inference is now at least as clear to my readers as it is to myself. If not, further illumination is obtainable from Professor Popper's paper on ' Logic without Assumptions ' in *Proceedings of the Aristotelian Society* for 1946–7, and from Professor Kneale's contribution to *Contemporary British Philosophy*, Volume III. I have also been much helped in my understanding of the notion by some lectures of Mr. Strawson's and some notes of Mr. Hare's.

I want now to draw attention to a point not generally noticed, namely that in this sense of ' analytically valid ' any statement whatever may be

inferred, in an analytically valid way, from any other. ' 2 and 2 are 5 ', for instance, from ' 2 and 2 are 4 '. It is done in two steps, thus:

> 2 and 2 are 4.
> Therefore, 2 and 2 are 4 tonk 2 and 2 are 5.
> Therefore, 2 and 2 are 5.

There may well be readers who have not previously encountered this conjunction ' tonk ', it being a comparatively recent addition to the language; but it is the simplest matter in the world to explain what it means. Its meaning is completely given by the rules that (i) from any statement P we can infer any statement formed by joining P to any statement Q by ' tonk ' (which compound statement we hereafter describe as ' the statement P-tonk-Q '), and that (ii) from any ' contonktive ' statement P-tonk-Q we can infer the contained statement Q.

A doubt might be raised as to whether it is really the case that, for any pair of statements P and Q, there is always a statement R such that given P we can infer R, and given R we can infer Q. But this doubt is of course quite misplaced, now that we have introduced the word ' tonk ' precisely in order to form a statement R with these properties from any pair of statements P and Q.

As a matter of simple history, there have been logicians of some eminence who have seriously doubted whether sentences of the form ' P and Q ' express single propositions (and so, e.g., have negations). Aristotle himself, in *De Soph. Elench.* 176 a 1 ff., denies that 'Are Callias and Themistocles musical? ' is a single question; and J. S. Mill says of ' Caesar is dead and Brutus is alive ' that ' we might as well call a street a complex house, as these two propositions a complex proposition ' (*System of Logic* I, iv. 3). So it is not to be wondered at if the form ' P tonk Q ' is greeted at first with similar scepticism. But more enlightened views will surely prevail at last, especially when men consider the extreme *convenience* of the new form, which promises to banish *falsche Spitfindigkeit* from Logic for ever.

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INCLINATION

By ALAN R. WHITE

I WISH to draw attention to two common senses of the word ' inclination ' and of the phrase ' inclined to '. Part of the controversy about the nature of motives arises, in my opinion, from the fact that some philosophers and psychologists equate motive-explanations with explanations involving one of these senses, while others equate motive-explanations with explanations involving the other of these senses. What I have to say about ' inclination ' and ' inclined to ' holds to some extent, I think, for ' disposition ' and ' disposed to ', which are commonly used by philosophers and psychologists in discussions of mental concepts.

To say of someone, including oneself, that he is inclined to do so and so may mean either (a) he is ready, tempted, to do it, he feels like, or in favour of, doing it; or (b) he commonly does or tends to do it. This difference is easily demonstrated. In sense (a) it is only a particular action which one can be inclined to do, e.g. refuse his offer; in sense (b) it is a type of action which one may be inclined to do, e.g. take one's corners too fast. One can in sense (a) often have been inclined to do something, e.g. chuck the whole thing, which one never in fact did; indeed if you did it, it is no longer true that you were *merely* inclined to do it. In sense (b), however, what one is inclined to do must be something which one has often done. There is a difference between saying ' I am often inclined to chuck the whole thing ' and saying ' I am very inclined to go out without my brief-case '.

It is only in sense (b) that one can include a judgment on an action, e.g. by saying of someone that he is inclined to talk *too* much, go *too* far, worry *excessively*. For the same reason one can be described as being inclined, in sense (b), either to try something or to accomplish or fail to accomplish something; but in sense (a) one can only be described as being inclined to do and not as being inclined to succeed or fail. Again, it is only in sense (b) that someone can be inclined to suffer, to have so and so happen to him, to be or become such and such.

The fact that both the animate and the inanimate can be inclined in sense (b), e.g. to worry too much or to shrink a lot, but only the animate can be inclined in sense (a), explains why it is only in sense (a) that someone can be said to ' feel ' inclined. If I am inclined to, that is tend to, spend too much money on cigarettes I need feel nothing, but if I am inclined to laugh on a particular occasion then I ' feel like ' laughing.

The noun ' inclination ' seems more commonly used in sense (a). It is in this sense that an inclination can be described as ' momentary ' or ' my first ', that it can be followed, succumbed to, or resisted, that something can be done from or against it. But we are using sense (b)

when we say, for example, that a bowler has an inclination to overstep his mark and, perhaps, when we describe an inclination as 'marked' or 'decided'.

We can explain a particular action as due to an inclination in sense (a), e.g. he had a second swim because he felt inclined to, felt like it, or, quite differently, by reference to an inclination in sense (b), e.g. he had a second helping because he is inclined to overestimate his capacity.

The two senses of 'inclination' and 'inclined to' are *logically* unconnected; neither implies the other. A man who is inclined to split his infinitives may never have felt inclined to do so, indeed may repudiate the suggestion; while a man who often feels inclined to laugh at others' mistakes may resolutely contain himself. With an *unique* action like committing suicide the man who feels inclined to do it cannot (logically) tend to do it; contrariwise, with a *result* like becoming puzzled the man who tends to become so cannot (logically) feel like becoming so. When, however, the two senses of the phrases are used of a type of behaviour there is a strong *natural* connection between them. Normally there is no reason why we should not do many of the things we feel inclined to; and, conversely, if we are not inclined to, that is do not tend to, indulge in certain sorts of behaviour, it is possibly because we have no inclination that way. It is not surprising, therefore, if in practice whoever is 'inclined' in one sense is also 'inclined' in the other; but the senses are logically quite different.

In sense (a) 'inclination' goes with such 'general condition' *feelings* as indignation, fear, hope, anxiety, feeling like living in the country; to feel indignant is to feel inclined to protest, to feel afraid is to feel like running away. A sudden, momentary, or strong inclination, say to kick someone downstairs, may relevantly be compared to an impulse or itching (compare Ryle on 'Feelings', *Philosophical Quarterly*, Vol. 1, no. 3 (1951) pp. 196, 199). When the O.E.D. includes 'a desire, fear, or other emotion . . . which influences' as part of its definition of 'motive', when many moral philosophers discuss motives in terms of 'inclination' (Kant) or 'desire' (e.g. Ross, Ewing, and their predecessors), and when some contemporary psychologists equate motives with drives, tensions, wishes, desires, etc. (for references see Peters, *The Concept of Motivation*, 1958), what they seem to give is an explanation of conduct in terms of this kind of inclination.

The tendency sense of 'inclination', on the other hand, goes with such *traits* as vanity, conceit, avarice, vivacity, tactlessness, indolence, fondness for gardening. A vain man is inclined to boast, a tactless man to drop conversational bricks. People who are characterised by these inclinations need not feel anything; we do not 'feel' vain, conceited, and fond of gardening as we 'feel' indignant, afraid, like living in the country. Talk of 'impulse', 'itching', 'craving' is out of place with

such inclinations as traits of vanity and indolence (Ryle, *The Concept of Mind*, pp. 83–93).

In *The Concept of Mind* Ryle mainly takes ' inclination ' as synonymous with ' tendency ' and ' trait '. Vanity, indolence, conceit, avarice, punctuality, etc., are indifferently referred to as traits or inclinations and are put in a category co-ordinate with, though not the same as, habits. Inclinations, like tendencies, are said to ' run counter ' to each other and to be ' stronger ' the more their owner tends to act in such and such a way. Because Ryle then equates this sense of ' inclination ' with ' motive ', he concludes that motives are behaviour trends.

Consequently, he opposes the view that inclinations, and motives, are ' occurrences ', ' impulses ', ' felt turbulences ' and dismisses it as a ' para-mechanical myth '. But this opposition is misleading if the holders of the attacked view are really using, albeit implicitly, ' inclination '—and hence, in their and Ryle's opinion, its equivalent ' motive ' —in the sense not of ' tendency ' but of ' feeling like doing '. Further, the plausibility of some of Ryle's own discussion of inclinations and motives depends on taking ' inclination ' in the latter and not the former sense. Thus a man disturbed by opposing ' wants ' is said to be ' inclined ' in two directions at once, to have opposing inclinations; and a man who is prevented from doing what he would like to do is said to have his inclination thwarted. An inclination is described as ' momentary ' and a person is said to ' tend to act from that inclination '. Again, Ryle's thesis that to say ' that someone has an inclination to do something that he is doing and no inclination not to do it can be signified indifferently by " he enjoys doing it " and by " he is doing what he wants to do " and by " he does not want to stop "' is only plausible if ' inclination ' is taken in the ' feel like doing ' sense.

We may legitimately explain a piece of human conduct by a tendency-inclination, e.g. a trait such as conceit or fondness for gardening. And we may legitimately explain it by a feeling-like inclination, e.g. feeling indignant or feeling like bursting out laughing. But these are quite different sorts of explanations; an instance of a tendency-inclination is not the same as a satisfaction of a feeling-like inclination. But neither explanation is like an explanation in terms of an end or purpose to be achieved. To interrupt a speaker because you have never acquired patience or courtesy and to interrupt him because your indignation or fear makes you incapable of restraining yourself are quite unlike each other and unlike interrupting him in order to put him out of his stride or to create a diversion. Whether or not we normally use ' motive ' only of the third type of explanation—as I believe we do—it is important not to confuse it with the first two or to confuse the first two with each other. The ambiguity of ' inclination ' and ' inclined to ' is, I suggest, one cause of the latter confusion.

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BODILY CONTINUITY AND PERSONAL IDENTITY: A REPLY

By B. A. O. WILLIAMS

IN a recent article in ANALYSIS[1] Mr. Robert C. Coburn has criticised an argument that I used in a paper called 'Personal Identity and Individuation'.[2] This argument was supposed to show that bodily continuity was a necessary condition of personal identity and, more particularly, that similarity of memory claims and personal characteristics could not be a sufficient condition of personal identity.

If I may summarise the argument again, it ran like this: suppose a person A to undergo a sudden change, and to acquire a character exactly like that of some person known to have lived in the past, B. Suppose him further to make sincere memory claims which entirely fit the life of B. We might think these conditions sufficient for us to identify A (as he now is) with B. But they are not. For another contemporary person, C, might undergo an exactly similar change at the same time as A, and if the conditions were sufficient to say that A=B, they would be sufficient to say that C=B as well. But it cannot be the case both that A=B and C=B, for, were it so, it would follow that A=C, which is absurd. One can avoid this absurdity by abandoning one or both of the assertions A=B and C=B. But it would be vacuous to assert one of these and abandon the other, since there is nothing to choose between them; hence the rational course is to abandon both. Therefore, I argued, it would be just as vacuous to make the identification with B even if only one contemporary person were involved.

Coburn's criticism of this argument is that it can be applied just as well to another case in which it gives unacceptable results. He supposes the case of a man George who suddenly disappears; 'a moment later an individual begins to exist who is in all discernible respects exactly similar to George (say, George*)'.[3] Coburn argues that to this case, too, my argument would apply, with the result that it would be vacuous to identify George* with George. But this, he argues, is unacceptable: such an identification would certainly not be vacuous, since much would depend on it (concerning e.g. punishment for George's crimes). Moreover it is an identification that we should justifiably accept. Hence my argument is called into doubt.

First, a point about 'vacuity'. In saying that an identification of A with B in the imagined circumstances was 'vacuous', I did not mean

[1] ANALYSIS 20.5, April 1960.
[2] *Proceedings of the Aristotelian Society*, LVII (1956–7).
[3] *loc. cit.*, p. 118.

that no consequences would follow from it. If the identification were taken seriously, consequences of the kind Coburn mentions could as well follow in my sort of case as in his. My use of the term 'vacuous' concerned not the consequences, but the grounds, of such an identification, my argument being meant to show that there would be in principle for such a case no grounds to justify a judgement of identity as against a judgement of exact similarity. I agree that the term 'vacuous' is misleading, in that it suggests that there would be no difference at all between the two judgements, and this, in terms of consequences, is false.

My argument can be put in another way to incorporate this point. Where there is a difference in the consequences, in this sense, of two judgements, there should all the more be a difference in their grounds, for it is unreasonable that there should be no more grounds for applying one of a pair of judgements to a situation rather than the other, and yet one judgement carry consequences not carried by the other. On the thesis that similarity of character and of memory claims is a sufficient condition of personal identity, there would be no difference in the grounds of two judgements, that of identity and that of exact similarity, one of which does carry consequences not carried by the other. Hence that thesis is to be rejected. (What is meant by 'exact similarity' here is '*mere* exact similarity', an assertion of which would entail the denial of identity.)

More important than this point about vacuity is the conclusion which Coburn states, or rather implies, that we should in fact in a case such as he describes identify George* with George, and be justified in so doing. If this conclusion is correct, and it is also correct that my reduplication argument would apply as well to this case, my argument must be defective. Now Coburn does not make entirely clear the circumstances of his imagined case. He does not say whether George* appears in the same place as that from which George disappeared; and while he says that George* appears 'a moment later', he does not say whether he regards the shortness of the interval as essential to his example or not. If Coburn allows distant places and long intervals of time for the appearance of George*, his case would in fact approximate to my original one, with physical resemblance added to the resemblances of character and memory claims. If, on the other hand, a short interval of time and reappearance in the same place are essential to Coburn's example, it is worth asking why this should be so.

I shall argue that if Coburn's example is to provide a case of identity, it must be restricted in this way; but that when it is restricted in this way, it is not a counter-example to my argument. The principle of my argument is, very roughly put, that identity is a one-one relation, and that no principle can be a criterion of identity for things of type T if it

relies only on what is logically a one-many or many-many relation between things of type T. What is wrong with the supposed criterion of identity for persons which relies only on memory claims is just that '. . . being disposed to make sincere memory claims which exactly fit the life of . . . ' is not a one-one, but a many-one, relation, and hence cannot possibly be adequate in logic to constitute a criterion of identity. (There are well-known difficulties about speaking of identity as a relation at all. The point being made here can be expressed more rigorously in terms of the sense and reference of uniquely referring expressions, but I hope it is clear enough in this rough, and shorter, form).

This principle states a necessary condition of anything's serving as a criterion of identity. It clearly does not state a sufficient condition; still less does it state a sufficient condition of anything's being, for a given type of thing T, a philosophically satisfactory criterion of identity for Ts. In particular (and this was the basis of the later part of my original argument), no principle P will be a philosophically satisfactory criterion of identity for Ts if the only thing that saves P from admitting many-one relations among Ts is a quite arbitrary provision.

Returning now to Coburn's example, it can be seen that if it is taken as quite unrestricted, the criterion of identity suggested by it will not pass the test just stated, any more than the bare memory and character criteria do; for the relation '. . . being in all respects similar to, and appearing somewhere at some time after the disappearance of, the individual . . . ' is many-one, and could not suffice to do what a criterion of identity is required to do, viz. enable us to identify uniquely the thing that is identical with the thing in question. However, if the principle is restricted in certain ways, this difficulty can be avoided. If, for instance, it is modified to: '. . . being in all respects similar to, and appearing as the first subsequent occupant of the place vacated by the disappearance of, the individual . . . ', it will pass the test, so long at least as two, slightly different, conditions are satisfied about the application of the expression ' the place vacated by . . . ': first, that it should be so restricted that it will not be possible for two persons simultaneously to occupy that place, and, second, that it should be sufficiently determinate not to leave it in doubt which of two or more places, so restricted, is the place in question.

It is perhaps this latter condition, among others, that introduces the consideration, not mentioned in the criterion as so far stated, but mentioned in Coburn's example, of the length of the lapse of time between disappearance and appearance. One reason at least why one might be moved to introduce a very brief lapse of time into Coburn's example is this: that if the lapse of time is very short, it is very much clearer what ' the same place ' will be. Granted a longer time, in which various changes can take place, it may become less clear and determinate what

' the same place ' will be. For instance, if George had been in bed in his bedroom when he disappeared, and the bed, before George* appears, is moved into another room or another house, where must George* appear in order to appear in the place vacated by George? Difficulties of this kind could be multiplied indefinitely. One motive for the introduction of a brief lapse of time is, then, perhaps this: that it makes the application of ' same place ' more determinate than it might otherwise be.

However, there is perhaps another motive for thinking in terms of a brief lapse of time: that it is only this that makes a criterion of identity in terms of ' same place ' plausible *at all*. For if the appearance of George* happens some substantial time after the disappearance of George, why should his appearance in precisely the place vacated by George be privileged in giving an answer to the identity question? Here we have a dilemma: on the one hand some such restriction is needed, to make the principle implied in the example into a criterion of identity at all; on the other hand, it seems equally to be in these circumstances quite arbitrary.

One reason for the latter is that in thinking about the imagined case we are in fact using a model drawn from the real world and our normal identification of persons: a model in which the disappeared George, though ' immaterial ', in some sense goes on existing, and in particular can move from one place to another. This model contains an illusion, no doubt; but to see that there is an illusion should lead one, not to stick unthinkingly to a criterion of identity to which identity of place is essential, but to conclude that the application of criteria of personal identity to these imagined cases of disappearance is a far less certain and indisputable business than may at first sight appear.

Now Coburn himself cannot consistently have in mind a restricted principle as the criterion of identity presupposed in his example, since he says that in his example reduplication would be possible. If the criterion presupposed in his example were restricted in the ways I have been discussing, no reduplication would be possible, since it could not be the case that two persons could both be the first subsequent occupants of the place (in the required sense) vacated by the disappearance of George.

It seems, then, that Coburn has in mind as suggested by his example a principle unrestricted in space and time. If so, I do not see how it can satisfy the logical requirements of being a criterion of identity. If, on the other hand, the principle were restricted in space and time, it would be a possible criterion of identity, in the sense at least that it satisfied the logical requirements of such a criterion; but in that case, the possibility of reduplication could not exist, and his case would not be a counter-example to my argument, which was directed against supposed criteria of identity which did not satisfy the requirements. If, again, the principle were restricted in space but not in time, it might still satisfy the logical

requirements (though there would be systematic doubts about its application), but it would scarcely seem a plausible or philosophically satisfactory sort of criterion. Whether, granted this point, the fully restricted criterion would be plausible or satisfactory, is a question I shall not pursue here, though I think the answer is in fact 'no'.

It may be objected to this argument that I have set too high the standard for a principle's serving as a criterion of identity, by requiring that it guard against the logical possibility of reduplication such as I have discussed. No criterion can guard against this, it may be said; and this can be seen from the fact that even a criterion of identity in terms of spatio-temporal continuity, on which I lay the weight for personal identity, is itself not immune to this possibility. It is possible to imagine a man splitting, amoeba-like, into two simulacra of himself. If this happened, it must of course follow from my original argument that it would not be reasonable to say that either of the resultant men was identical with the original one: they could not both be, because they are not identical with each other, and it would not be reasonable to choose one rather than the other to be identical with the original. Hence it would seem that by my requirements, not even spatio-temporal continuity would serve as a criterion of identity: hence the requirements are too high.[1]

I do not think, however, that this case upsets the principle of my argument. There is a vital difference between this sort of reduplication, with the criterion of spatio-temporal continuity, and the other sorts of case. This emerges when one considers what it is to apply the criterion of spatio-temporal continuity. To apply this criterion—for instance, in trying to answer the question whether a certain billiard ball now in my hand is the billiard ball that was at a certain position at the start of the game—is to engage in a certain sort of historical enquiry. The identity-question contains two expressions each of which picks out an object of a certain type under a description containing, in each case, a different time-reference; to answer the question is to chart an historical course which starts from the situation given by one of the descriptions, in order to see whether this course does or does not lead to the situation given by the other. This procedure, ideally carried out, will give the entire history in question; and in particular, if there were any reduplication of the kind under discussion, *it would inevitably reveal it.* This consideration puts the spatio-temporal continuity criterion into a different situation from the others discussed; for in this case, but evidently

[1] This sort of case has been discussed in his contribution to this topic by Mr. C. B. Martin (ANALYSIS 18.4, March 1958). Martin's own criticism, however, seems merely to confuse identity with the quite different concept of 'having the same life-history as', where this is defined to suit the amoeba-like case. To say that (putatively) two amoebae are identical is to say that *pro tanto* I have only one amoeba; to say that they share the same life-history is not. Cf. Mr. G. C. Nerlich, ANALYSIS 18.6, June 1958, on this point.

not in the others, a thorough application of the criterion would itself reveal the existence of the reduplication situation, and so enable us to answer (negatively) the original identity question. To enable us to answer such questions is the point of a criterion of identity. Thus, in this case, but not in the others, the logical possibility of reduplication fails to impugn the status of the criterion as a criterion of identity.

I think that these considerations perhaps suffice for us to say that in a case of fission, such as that of an amoeba, the resultant items are not, in the strict sense, spatio-temporally continuous with the original. The justification for saying this would be that the normal application of the concept of continuity is interfered with by the fact of fission, a fact which would itself be discovered by the verification procedure tied to the application of the concept. There would be a motive for saying this, moreover, in that we might want to insist that spatio-temporal continuity, in the strict sense, was transitive. But for the present issue, nothing immediately turns on our decision on this point.

It may be said that for most sorts of objects to which spatio-temporal continuity applies, we do not in fact pursue our identity enquiries in this thorough-going historical way. This is true, but nothing to the point; because, for most sorts of objects, we have the strongest empirical reasons for disbelieving in reduplication. Where we have not such reasons—for instance with amoebae—one would indeed (in the unlikely event of one's wanting to answer an identity question) have to watch out for reduplication, by constant observation or otherwise.

I conclude, then, that this sort of case, because of its special nature, does not tell against my general position; which is that in order to serve as a criterion of identity, a principle must provide what I have called a one-one relation and not a one-many relation. Unless there is some such requirement, I cannot see how one is to preserve and explain the evident truth that the concepts of identity and of exact similarity are different concepts.

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